

Atty Docket: 740186-29

U.S. Serial No. 10/658,204
Amendment
Response to OA dated January 26, 2005

REMARKS

Applicant respectfully traverses the objections to the drawings under 37 CFR 1.83(a). The basis of the objection is that the drawings must show every feature of the invention specified in the claims, and that therefore, "the plurality of loads must be shown or the feature(s) canceled from the claim(s)." Applicant would point out that in Figures 2, 3 and 4, multiple loads in the forms of motors IM1, STM1, DCM are clearly indicated in the top portion of each of these figures. Accordingly, Applicant respectfully requests the Examiner to reconsider and withdraw the objection to the drawings.

Applicant recognizes that the Examiner's objection may have come from construing the first limitation of claim 1 to mean that each motor applies a plurality of loads to the motor driving circuit. Insofar as the objection under 37 CFR 1.83(a) may be based on such a construction, the Examiner should note that Applicant has revised Claim 1 to replace "contained in" to --from--.

The objection to claims 1 and 5 over the use of the word "type" has been obviated by deleting this word from the limitations of these claims.

The rejection of claims 1 and 5 under 35 USC 112, second paragraph, has been obviated by revising the penultimate paragraphs of claims 1 and 5 to specifically recite that it is the PNP and NPN transistors that are being driven by either a constant electric current through a feedback loop or a constant electric current through an open loop. Finally, the words "adjacent thereto are paired to constitute" has been replaced with --constituting-- in the last paragraph of these claims. For all these reasons, Applicant respectfully requests the Examiner to reconsider and withdraw the rejection of claims 1-5 under 35 USC 112, second paragraph.

The rejection of claim 1 under 35 USC 102(b) over the Ishimura '778 patent is respectfully traversed. However, before the specific distinguishing limitation in claim 1 is discussed in detail, a brief overview of the principal features of the invention will be discussed in order that the differences between the claimed invention and the Ishimura '778 patent may be more fully appreciated.

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As shown in Figs. 1 and 2, the inventive motor driving apparatus comprises a driving circuit including channels CH1 and CH2, and a control circuit 2. The driving circuit drives a plurality of loads from a plurality of motors IM1, IM2, STM1 and DCM. The control circuit 2 controls the driving circuit to sequentially drive the plurality of the motors IM1, IM2, STM1 and DCM. The driving circuit is provided with eight output terminals OUT1-OUT8 in order to connect to seven different loads. Each of the output terminals OUT1-OUT8 is led out from a node of a PNP type transistor and an NPN type transistor connected in series through the node in such a configuration that each pair of adjacent output terminals OUT1, OUT2; OUT3, OUT4; etc. constitutes a bridge circuit HA, HB, etc., assigned to drive one of the loads IM1, STM1, etc. The control circuit 2 turns on and off the PNP and NPN type transistors Q1-Q4 of the bridge circuit HA to thereby energize the load IM1 in either of a normal direction and a reverse direction. A particular one of the output terminals OUT1 is led from a node of a particular PNP type transistor Q1 and a particular NPN transistor Q2, one of which (Q2) is driven by a constant electric current through a feedback loop and the other of which (Q1) is driven by a constant electric current through an open loop. The operation of the circuit 4 in providing constant current and constant voltage on transistors Q1 and Q2 is described in detail in the paragraph bridging pages 11 and 12 of the specification.

As recited in the penultimate paragraph of claim 1, the particular output terminal OUT1 and another output terminal OUT2 adjacent thereto are paired to constitute a particular bridge circuit HA for driving a particular load IM1 by the constant electric current through either of the feedback loop and the open loop depending on whether the particular load is energized in the normal direction or the reverse direction. This is of particular advantage in a digital camera, where an exposure quantity depends on the closing operation. Therefore, in the closing operation of the invention, a constant electric current driving mode by use of a feedback loop capable of control at high speed and high accuracy is employed. On the other hand, in the shutter opening operation, which has no direct influence on the exposure quantity in the digital camera, an open loop-type constant electric current control mode is employed.

By contrast, the '778 patent neither discloses nor suggests the aforementioned feature recited in the penultimate paragraph of claim 1. The transistors Q1-Q4 are for driving a photographing sequence motor M1 and are connected in a bridge arrangement so that the

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sequence motor M1 can be driven in a reversible manner. The transistors Q3-Q6 are for driving a lens driving motor M2 and connected in a bridge arrangement so that the lens driving motor M2 can be driven in a reversible manner. Both terminals of the sequence motor M1 are connected to the common junction of the transistors Q1 and Q2 and to the common junction of the transistors Q3 and Q4, and also both terminals of the lens driving motor M2 are connected between the common junction of the transistors Q3, Q4 and the common junction of the transistors, Q5, Q6. It is noted that the transistors Q3 and Q4 are used in common in these two bridge circuits. The sequence motor M1 is a photographing sequence control motor, which, upon forward rotation, uses a mirror drive mechanism to lift up the reflex mirror to its top position and a diaphragm operating lever to stop down the diaphragm, while upon reverse rotation, winds up the photographic film and restores the mirror drive mechanism and the diaphragm operating lever to their initial state, so that the reflex mirror is returned to its lower inclined position and so that the diaphragm is returned to its fully open position. The lens driving motor M2 is a motor for driving a lens used for the AF operation, which upon forward rotation, shifts the lens forward and upon reverse rotation, shifts the lens rearward. OM1 to OM6 are control signal lines for switching each of the transistors Q1-Q6. Table 2 shows the on and off condition of the transistors Q1-Q6 controlled by the control signal lines OM1-OM6 respectively in order to control the sequence motor M1 and lens driving motor M2.

In the above-mentioned construction, the six-transistors Q1-Q6 are used with two transistors Q3 and Q4 in both of the bridge circuits, so that the two motors M1 and M2 are prevented from simultaneous driving. By this arrangement, the number of the terminals CPU1 and the driver controller 8 can be reduced, and the size of the driver 8 can be reduced. However, the Ishimura '778 patent fails to teach the inventive feature of a bridge circuit that drives a load by a constant electric current through either of the feedback loop and the open loop depending on whether the load is energized in a normal direction or a reverse direction. Hence, the Ishimura patent does not have the capability of applying a constant current driving mode by use of a feedback mode to close the shutter of the camera, which, as previously pointed out, constitutes a major advantage of the invention.

For all these reasons, amended claim 1 is clearly patentable over the Ishimura '778 patent.

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As claims 2 and 3 have been indicated as reciting patentable subject matter, no further discussion of these claims is deemed necessary.

Claim 4 is patentable at least by reason of its dependency upon amended claim 1. Claim 4 is further patentable for its further recitation that the particular bridge circuit constituted of the particular output terminal drives as the particular load "a motor contained in a digital camera for opening and closing a shutter in such a manner that the motor is driven by the constant electric current through the open loop when opening the shutter and driven by the constant electric current through the feedback loop when closing the shutter ...", thereby making even more express the principal advantage associated with the invention.

Finally, as claim 5 recites all of the aforementioned distinguishing limitations discussed with respect to amended claim 1, claim 5 is patentable at least for the reasons given with respect to amended claim 1.

Now that all the claims are believed to be patentable, the prompt issuance of a Notice of Allowance and Issue Fee Due is hereby earnestly solicited.

The Commissioner is authorized to charge any overage or shortage of fees connected with filing of this Amendment to Deposit Account No. 19-2380.

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